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ABSTRACT

Though information systems may be available, potential users may not know enough about them to take advantage of the information stored there. The author used a case study method to assess the effectiveness of exposure to information on the Medical Literature Analysis and Retrieval System (MEDLARS) on potential users of the system at the University of Illinois. A "change agent" made a slide-script presentation on the demand/search service, the information stored in the system, retrieval methods, and a detailed explanation of ways to obtain the service. Some of those present also received a "Guide to MEDLARS Services" by mail later. An analysis of MEDLARS use showed that the presentation and mailing had a positive relationship to the number of subsequent adoptions of MEDLARS. (LS)

ED 09789

THE DIFFUSION OF INFORMATION INNOVATIONS*

by Robert A. Berk**

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Introduction

My doctoral research has to do with information storage and retrieval systems. As you are aware, a great deal of research has been conducted in the past on user studies which serve as the basis for system design, with the actual design of the system, and with the evaluation of the effectiveness of the system once it has been implemented. It has appeared to me for sometime that there is another important element in this provision of information to potential users--that is, between system design and evaluation there is one part of the implementation process that has been largely ignored by those concerned with improving the delivery of information. This I have chosen to call system interface, which means providing sufficient information to potential users of an information system to enable them to be aware of the system being offered, know what the system entails, and know how to obtain the benefits of the system. With this information they are then able to evaluate the information system in light of their own information needs. It appears that this interface has been too often ignored or given only slight importance in connection with many information storage and retrieval systems in the past. Granted that some of the large information systems of the published abstracting and indexing variety such as Science Citation Index have consciously attempted to provide this interface by means of seminars conducted throughout the country. But even so, the effect of such attempts at this interface has not been adequately measured.

The thrust of my research was an attempt to supply this sufficient information about a system to potential users and then measure the effect of this information on subsequent use of the information system. From this, it might be possible to incorporate information innovations (as I have chosen to call them) into the research on the diffusion process for other types of innovations.

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Research Design

The information innovation chosen for this study was the Medical Literature Analysis and Retrieval System--Demand Search Service of the National Library of Medicine. As you are aware, the MEDLARS search system is now an on-line system called MEDLINE, but this had not yet become available at the time the data for this research was collected.

The objectives of the research were to: (SLIDE 1)

1 - Identify a body of potential users of the Demand Search Service

2 - Determine the degree of awareness of the service and the use of the service prior to the start of this study

3 - Provide a means of supplying these individuals with sufficient information about the Demand Search Service to enable them to evaluate it in light of their own information needs

4 - Measure the effect of this exposure to sufficient information, by their subsequent adoption of the innovation during a six-month adoption period

An experimental case study design was chosen because it provided an excellent opportunity to accomplish the above objectives. However, it was recognized that it severely limited the possibility of any generalizability of the findings. But because of the case chosen, and the results from a pilot study involving a completely different universe, there is reason to believe that this case is not atypical.

The Universe

The universe consisted of all departments that might have members with an interest in the content of the data base for the Demand Search Service at the Champaign-Urbana and the Chicago Medical campuses of the University of Illinois.

Employing MEDLARS journal coverage and subject heading approaches, 15 departments were selected for the Champaign-Urbana location and 21 for the

Chicago location. These departments were grouped according to their degree of involvement with the central content of the data base and 11 departments were randomly selected (one from each of the 11 groups) to receive exposure to information about the Demand Search Service.

(SLIDE 2)

This slide shows the groupings for each location and the department selected from each group to receive the exposure. The size figures for each department, in most cases, indicate a head count of the faculty, staff, and graduate students--all presumed to be potential users of the system. In each case, the departments in the group not chosen to receive the exposure, were to serve as control departments. This would enable the researcher to test the primary hypothesis that those in the departments receiving the exposure would have a higher adoption rate for the Demand Search Service than would those in the control departments for the six-month adoption period following this exposure.

It should be noted that the total estimated potential user population for the universe of 6052 is not exact and is undoubtedly greatly underestimated. Such underestimation would, however, only increase the significance of any findings that supported the primary hypothesis.

Stage Concept of the Diffusion Process

One assumption of this study, based on the experience of researchers interested in the diffusion process for other types of innovations, was that a change agent would probably be the most effective means of providing exposure to information about the Demand Search Service. A change agent being defined as someone who provides sufficient information to enable potential adopters to achieve various stages in the diffusion process. Based on the work of other researchers, notably Rogers, Coleman, Rubenstein, and Havelock and their

associates, only three stages were postulated as being part of the diffusion process for information innovations. These were (SLIDE 3):

1 - The Awareness Stage during which the potential adopter of an information innovation first learns of the existence of an information product or service.

2 - The Interest/Trial Stage - during which he receives sufficient information to enable him to evaluate the product or service in light of his own information needs.

3 - The Adoption Stage during which he actively employs the product or service in an attempt to fulfill his information needs.

Other stages, and the separation of the interest from the trial stage have been suggested for other types of innovations, but in light of the characteristics associated with information innovations, these three were selected.

Classification of Information Innovations

A necessary part of the research design involved the classification of information innovations to serve as a basis for comparing the possible diffusion of information innovations other than the Demand Search Service. Again, based on the work of those in other disciplines, the following dimensions or characteristics were defined in terms of information innovations: (SLIDE 4)

1 - Relative Advantage is the degree to which an information innovation is perceived by potential adopters as being an improvement over the information product or service it replaces. It was assumed that the Demand Search Service would be positive in this respect and have a high degree of relative advantage.

2 - Compatibility is the degree to which the potential adopters perceive the information innovation as consistent with existing values, past experience, and current needs. The norm of the scientific community was assumed to be progressive and because this innovation does not contain any threat or risk to the adopter, compatibility was assumed to be positive to a high degree.

3 - Trialability is the degree to which an information innovation may be experimented with on a limited basis. In the case of the Demand Search Service, the printed Index Medicus would allow for reversion to another method of obtaining the same result.

4 - Complexity is the degree to which the innovation is difficult to understand and use. Seldom does it appear that the complexity of information innovations ia as great as the degree of complexity faced by the scientific community in the day-to-day conduct of its work. Most information innovations, including the Demand Search Service, were assumed to be fairly low in complexity.

5 - Observability is the last dimension and refers to the degree to which results of adoption are visible to others. The Demand Search bibliographies, including those selected for wider distribution and publicized in various medical journals, lends support to a high degree of observability for this service.

Based on such a classification, it was felt that this research could have applicability for other information innovations with similar characteristics. Such information innovations would have to have: (SLIDE 5)

1 - Cost borne by someone other than the adopter of the innovation.

2 - A potential usefulness for a large body of users.

3 - No degree of threat to those who adopt it, either physical through application as in the case of some drug innovations, or social as in the case of professional censure.

4 - Several alternatives which serve the same purpose or lead to the same end. However, with advantages clearly superior to those of the alternatives.

5 - Not been widely adopted, but could, and probably should be.

The Change Agent

The role of the change agent for this research, then, consisted of providing sufficient information to a potential adopter of the Demand Search Service to enable him to fulfill the requirements of the awareness, and the interest/trial stages of the diffusion process. Hopefully, this would result in significantly greater adoption of the service by those exposed to the change agent than by those not exposed in the control departments.

Need for the innovation was assumed, but limited adoption of the service prior to the start of this study was based on findings of a pilot study in a medical school library in the Pacific Northwest.

(SLIDE 6) This pilot study showed that only 49 individuals had adopted the Demand Search Service from the time it became generally available to the biomedical community in 1965 until the time of the pilot study in 1970--a period of more than five years. Forty-nine adoptions out of a potential user population of several thousand.

This assumption of low prior adoption was later substantiated for the case study.

(SLIDE 7) There were 66 adoptions for the University of Illinois prior to the start of this study or from the time of the establishment of the Midwest Regional Medical Library in October of 1968, until the start of the data collection in March of 1971. This means that only 1% of the potential adopter universe had previously adopted a service designed to fulfill a major function with regard to their information needs.

In an attempt to change this, a direct, interactive means of exposure in which the change agent provided intense coverage of the information system was devised. Coverage by the change agent included: (SLIDE 8)

1 - What the Demand Search Service entails--the makeup of the data base and how information is stored in that data base.

2 - The ways in which information can be retrieved including several examples.

3 - A detailed explanation of how the service may be obtained including an analysis of the Demand Search Request Form.

It was intended that the change agent would strive to project an image of credibility. One way of achieving such credibility appeared to be by means of a "soft sell." Accordingly, information was provided and questions answered, but no attempt was made to convince the individual that the service would be suitable for his individual information needs. This was his decision to make.

Other types of exposure were also employed in an attempt to determine if the primary method involving a slide-script presentation of approximately 40 minutes was, in fact, the most effective. A random subsample of those attending departmental presentations were sent additional or reinforcement exposure by means

of a publication explaining the system in even greater detail. It was assumed that this added exposure could increase the possibility of adoption of the service for this sample. Another random sample of those in the experimental departments who did not choose to attend the presentation was also selected and these individuals were sent (SLIDE 9) a Guide to MEDLARS Services explaining the service but in much less detail than that provided in the presentation.

Methodology

An arbitrary adoption period of six-months was established, presentations scheduled and conducted, reinforcement and mail exposure provided, library records analyzed, and follow-up studies conducted.

Data were gathered from the exposure samples by means of a questionnaire administered at the time of the presentation or mailed to the exposure sample, and by means of an interview schedule used with the follow-up groups in an attempt to establish a causal relationship between exposure to the change agent and subsequent adoption of the service.

The questionnaire sought to acquire data relating to: (SLIDE 10)

1 - The individual's current knowledge concerning the Demand Search Service.

2 - His past use of the service.

3 - His access to other channels of communication:
Journals read or scanned
Professional association memberships
Professional association meetings attended

4 - Need for the service:
Literature search activity
Research activity
Publishing activity

5 - Sociometric relationships of possible usefulness in subsequent diffusion of the change agent's message to other departmental members.

6 - An evaluation of the potential benefit of the service for the individual:
    Anticipated future use
    Value of the exposure received from this study

It is important to keep in mind that this is a case study and the respondents from the various samples are self-selected. No attempt was made to attract more or to insure any predetermined level of attendance at the presentations. Advertising was provided to some of the departments, the presentations often being scheduled as part of a weekly seminar, but attendance was voluntary. The data for some of the above variables must be interpreted in this light because such self-selection introduces possible intervening variables over which there was no control.

Findings

During the adoption period of 6 months following exposure to the change agent, there were 69 adoptions for the universe. (SLIDE 11) Here we have a breakdown by type of exposure received. Of the 69 adoptions, 27 were by individuals exposed to the change agent. Differences by type of exposure are not statistically significant but the overall adoption rate for the exposure samples of 10% is significant compared to the number of adoptions prior to the start of the study. Equally important, is the function of the change agent in reducing the time required for the diffusion of the innovation.

Of the 42 adoptions by persons not directly exposed to the change agent, 26 were members of departments receiving the presentation. These individuals did not, however, attend the presentation or receive the mail exposure. Followup studies did show, nonetheless, that 10 of these adoptions could be attributed to the influence of the change agent. These 10 persons indicated that their decision to adopt the service was a result of information relayed to them by a person attending the presentation. This type of secondary adoption is fundamental to a communication model for the diffusion of information innovations of this type

and when these 10 adoptions are added to the 27 by the presentation and mail exposure samples, the significance of the change agent is increased.

A statistically significant difference was also found between the number of adoptions by the exposure samples compared to the control departments. This allowed for rejection of the null hypothesis concerning the relationship between exposure to the change agent and subsequent adoption of the Demand Search Service.

To further increase support for the function of the change agent in the diffusion process, a significant difference in adoption by location between Champaign-Urbana and Chicago that had existed prior to the start of this study was eliminated with one more adoption for the Champaign-Urbana location than for the Chicago location at the conclusion of the adoption period. (SLIDE 12) The adoption figures prior to the start of the study showed 40 adoptions for the Chicago location and only 26 for the Champaign-Urbana location. Following the adoption period, Champaign-Urbana had 14 adoptions and Chicago Medical campus had 13.

Based on indicators of communication behavior involving the number of journals read or scanned regularly, and attendance at professional association meetings, a communication index was devised to test for significant relationships between exposure to channels of communication (other than the change agent) and the various stages in the diffusion process. No significant relationships were found.

A similar index was constructed for indicators of need for the innovation involving research and publication activity. Again, no significant relationships could be detected when the level of need was held constant and alternately, when the type of exposure received was controlled.

Consequently, with the rejection of several null sub-hypotheses relating to the independent variables of formal and informal channels of communication

and to need for the innovation, support for the primary hypothesis is increased--that is, exposure to sufficient information is the most important variable in the diffusion process for an information innovation such as the Demand Search Service.

Conclusion

It does appear that the stage concept of the diffusion process applies to information innovations such as the Demand Search Service. Prior to the start of this study, (SLIDE 13)

a) 98 of the 194 individuals in the exposure samples had heard of MEDLARS

b) Of these 98--63 were also aware of the service that was being offered as the Demand Search Service

c) Of these 63--29 knew how to obtain the service

d) of these 29--10 had used the service

However, as to its potential usefulness, over 90% of those in the exposure samples indicated at the time of exposure that the service would be of benefit to them in their work.

From this one can assume that the change agent approach utilizing different methods of exposure was able to move all of the 194 individuals in the exposure samples from the awareness stage, through the interest/trial stage, and for 27 of these individuals--the adoption stage. Secondary adoption by 10 persons in the presentation departments who did not attend the presentation or receive the mail exposure also indicates the possibility of achieving subsequent adoption after the change agent has left the scene. If, as the data indicate, exposure to other channels of communication and need for the innovation, are present but not directly related to adoption of the service, then the role of the change agent in shortening the time span and increasing the number of adoptions for information innovations with the dimensions of the Demand Search Service seems very important.

In view of the scarcity of research dealing with system interface, it appears that this research can point toward several possible avenues for further

investigation. If the change agent is to be effective, how can he reach a greater number of potential users of an information product or service? What means of exposure will be most effective under what circumstances? How can those who design information systems plan for this system interface and design systems accordingly that will accommodate the greatly increased number of users when system interface is successful.

As a final note, I would like to offer the results of this research to librarians in all types of libraries who have services to offer to their potential user populations. An information innovation may be almost anything from a new card catalog to a sophisticated information retrieval system, but each can be classified with regard to the dimensions discussed here. Each can be subject to the same type of system interface with regard to various stages in the diffusion process. Accordingly, let us not forget the role of the librarian as a change agent and the importance of this function in the overall system design.

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